

Observation of Photoionization Fronts in Laboratory Experiments*

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Photoionization fronts are meaningful drivers of transformation for astrophysical phenomena and remain difficult to produce in laboratory experiments. As the universe evolved, the first dense structures were galaxies made mostly of dark matter which lead to sustained ionizing radiation, starting the reionization epoch. When minihalos cooled atomically, populations of stars emerged creating photoionization fronts forming these galaxies. Experiments at the OMEGA Laser Facility can create relevant photoionization conditions. One can generate an X-ray source with radiation temperature of about 90eV that irradiates a nitrogen medium held at high pressures. A laser irradiated gold foil generates an X-ray source which propagate deeper into a nitrogen gas cell. Measuring the temperature, density, and ionization state of the heated region yields ratios for the calculation of atomic rate coefficients.

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